DEPARTMENT OF THE ARMY
HEADQUARTERS, UNITED STATES ARMY MEDICAL COMMAND
2050 Worth Road
Fort Sam Houston, Texas 78234-6000

MEDCOM Regulation
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Medical Services

U.S. ARMY MEDICAL COMMAND RADIATION SAFETY PROGRAM

Supplementation of this regulation and establishment of forms other than MEDCOM forms are prohibited without prior approval from HQ MEDCOM, ATTN: MCPO-SA.

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CHAPTER 1

INTRODUCTION

1-1. HISTORY. This is the first printing of this publication.

1-2. PURPOSE. This regulation establishes the U.S. Army Medical Command (MEDCOM) Radiation Safety Program (RSP) as required by Army Regulation (AR) 11-9, paragraph 1-4m(3). Its objective is to ensure that radiation sources within the MEDCOM are used safely and that MEDCOM organizations comply with all applicable Federal, Department of Defense (DOD), Army, state, and host nation regulations and Status of Forces Agreement (SOFA) requirements. It also addresses radiation safety issues that are specific to the medical treatment and medical research environments. This regulation is applicable to all MEDCOM organizations and installations worldwide.

1-3. REFERENCES. References are listed in appendix A.

1-4. EXPLANATION OF ABBREVIATIONS AND TERMS. Abbreviations and special terms used in this regulation are explained in the glossary.

1-5. RESPONSIBILITIES.

a. The Surgeon General (TSG) will--

(1) Approve the use of investigational radiopharmaceuticals in accordance with (IAW) AR 40-7.

(2) Approve the use of radioactive material in clinical investigations IAW AR 40-38.

(3) Approve the use of human volunteers for radiation studies IAW AR 70-25.

b. The Commanding General (CG), MEDCOM has overall responsibility for the Radiation Safety Program.

c. The Chief of Staff (CoS), MEDCOM will--

(1) Chair the MEDCOM Radiation Safety Council (MRSC).

(2) Designate, in writing, the members of the MRSC.

(3) Designate, in writing, a person to be the MEDCOM Radiation Safety Staff Officer (RSSO). The MEDCOM RSSO will be an O5/O6 72A or the civilian equivalent and be approved by the MEDCOM Radiation Safety Committee (RSC).

(4) Issue Army Radiation Authorizations (ARAs) to MEDCOM organizations IAW AR 11-9 and chapter 2 of this regulation.

(5) Ensure that subordinate commands possessing Army radioactive commodities comply with conditions of radioactive commodity U.S. Nuclear Regulatory Commission (NRC) licenses and ARAs.

d. The Functional Proponent for Preventive Medicine will--

(1) Develop policy, execute, and provide oversight of the MEDCOM RSP.

(2) Act as Office of The Surgeon General (OTSG) and MEDCOM lead on all radiation safety issues.

e. The Nuclear Medical Science Officer/Radiological Hygiene Consultant to TSG will--

(1) Recommend Army radiation safety personnel exposure standards to TSG as necessary.

(2) Ensure that Army radiological health guidelines for deployment operations are developed and provided to TSG for promulgation as necessary.

(3) Act on potential overexposure notifications from the U.S. Army Primary Standards Laboratory, Ionizing Radiation Dosimetry Branch (IRDB), Redstone Arsenal, Alabama.

(4) Review investigations of suspected overexposures greater than annual dose limits found in Title 10, Code of Federal Regulations, Part 20 (10 CFR 20) and AR 11-9 and make the final dose assignment.

(5) Advise TSG on the medical and health aspects of exposure to ionizing radiation.

(6) Act as liaison with the NRC and other Federal agencies for Army medical licensing policies and radiation safety standards.

f. Commanders of medical commands outside the continental United States will--

(1) Ensure that all subordinate medical commands comply with this regulation.

(2) Ensure that subordinate commands possessing Army radioactive commodities comply with conditions of all applicable radioactive commodity NRC licenses and ARAs.

g. The MEDCOM RSSO will--

(1) Establish and provide staff oversight of the MEDCOM RSP.

(2) Advise the Commander, MEDCOM and the MEDCOM Staff concerning radiation safety issues within the command.

(3) Provide a quarterly report on radiation issues to the CoS, MEDCOM. This report will include, but not be limited to, the status of NRC Licenses, status of ARAs, status of quarterly reports, summary of unusual occurrences and a status of the tri-annual program evaluations.

(4) Survey, or request a survey of, the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) at least once every 3 years for compliance with applicable radiation safety and health regulations and guidance.

(5) Provide and update, as necessary, a list of Army radiation safety points of contact (POCs).

(6) Serve as the MEDCOM radiation safety POC. Act as liaison with the NRC for Army medical licensing as required.

h. Commanders, MEDCOM Major Subordinate Commands (MSCs) will--

(1) Designate, in writing, a person to act as the Command Radiation Safety Officer (CRSO). For MSCs that possess NRC licenses or ARAs, the CRSO will be a 72A or the civilian equivalent. At a Regional Medical Command (RMC), the CRSO should be the regional medical center Radiation Safety Officer (RSO). All CRSOs must be approved by the MRSC.

(2) Ensure that all subordinate units comply with this regulation.

i. The Commander, U.S. Army Medical Department Center and School will prepare training modules, in coordination with CG, Training and Doctrine Command and CG, Army Materiel Command concerning the health hazards of, protection from, and medical treatment of injuries caused by U.S. and foreign radiation sources that may expose Army personnel during deployment.

j. The Commander, USACHPPM will--

(1) Survey each installation and each NRC licensee, Army reactor permit holder, and ARA holder (except U.S. Army Medical Department Activities which will be surveyed by the RMCs) at least once every 3 years for compliance with applicable ionizing radiation safety and health regulations and guidance. The report for each survey will be forwarded to the MEDCOM RSSO.

(2) Survey each installation at least once every 3 years for compliance with applicable nonionizing radiation safety and health regulations and guidance. The report for each survey will be forwarded to the MEDCOM RSSO.

(3) Review NRC license and ARA applications and amendments forwarded from MEDCOM for adequacy and compliance with Army, DOD, and Federal requirements. The applications and amendments will be processed as specified in chapter 2 of this regulation.

(4) Maintain an Armywide archive of NRC licenses, applications, and amendments; supporting documents; and communication between the NRC and the licensees as provided by the Major Army Commands (MACOMs) IAW AR 11-9.

(5) Maintain an Armywide archive of ARAs, applications, and amendments; supporting documents; and communication between the MACOMs and the authorization holder as provided by the MACOMs IAW AR 11-9.

(6) Perform acceptance tests of new and upgraded Computed Tomography systems IAW Technical Bulletin, Medical (TB MED) 521.

(7) Investigate suspected nonionizing radiation overexposures IAW AR 40-5 and AR 385-40.

(8) Maintain an Armywide archive of all nonionizing radiation overexposure cases and incident investigation reports for use in future comparisons and for historical significance.

(9) Investigate incidents of Electromagnetic Interference (EMI) and Electromagnetic Compatibility (EMC) problems in medical treatment facilities (MTFs) and other incidents relating to MEDCOM electrical and electronic equipment. Findings and recommendations pertaining to EMI incidents will be forwarded to all affected activities and, through command channels, to the MEDCOM Safety Director; Chief, MEDCOM Risk Management and Quality Assurance; and the MEDCOM RSSO.

(10) Perform radiation hazard evaluations on all Army materiel that emits nonionizing radiation IAW AR 11-9 and AR 40-5.

(11) Maintain records of surveys, reports, calculations, and control measures for each type-classified radiofrequency (RF) or laser/optical radiation emitter evaluated.

(12) Provide nonionizing radiation safety training to RSOs and Laser Safety Officers (LSOs).

(13) Provide basic RSO training for personnel assigned as RSOs at small MTFs that possess only x-ray systems.

(14) Perform health hazard assessments for commodities and systems that emit radiation or contain radioactive material as early as practical in development and before fielding.

(15) Provide in-vitro radiation bioassay services that comply with criteria of the American National Standards Institute (ANSI) (see ANSI N13.30) on a cost-reimbursable basis.

(16) Provide technical assistance in radiation safety issues as requested by other Army agencies.

k. Each RMC Commander will--

(1) Conduct compliance surveys of medical, dental, and veterinary x-ray systems within their region as specified in TB MED 521 at facilities that do not have a qualified surveyor on staff.

(2) Review the RSPs and image quality control programs at each facility where the x-ray surveys required by paragraph (1) above are performed for compliance with AR 11-9, TB MED 521, this regulation, and other applicable regulations and standards.

(3) Survey each MTF in their region that possesses an NRC license and/or ARA at least once every 3 years for compliance with applicable radiation safety and health regulations and guidance. The report for each survey will be forwarded to the MEDCOM RSSO. (This requirement for triennial surveys does not preclude the RMC from performing site assistance visits (SAVs) for these facilities on a more frequent basis, if necessary.)

(4) Review NRC license applications and amendments and ARA applications and amendments from MTFs within their region and forward them to the MEDCOM RSSO or the NRC IAW chapter 2 of this regulation.

(5) Provide technical assistance regarding radiation safety issues to other MTFs within their region.

l. Each MEDCOM Installation Commander will--

(1) Designate, in writing, a qualified individual to act as the Installation RSO IAW AR 11-9.

(2) Ensure that activities possessing Army radioactive commodities on the installation comply with conditions of all applicable radioactive commodity NRC licenses and ARAs.

(3) Issue Army Radiation Permits (ARPs) as necessary IAW AR 11-9 and chapter 2 of this regulation.

m. Each commander will--

(1) Designate, in writing, a qualified person to be the RSO (and/or LSO) when required by AR 11-9.

(2) Appoint a qualified person to serve as ARSO when an ARA or USNRC license is held.

(3) Establish a written RSP when paragraph (1) above requires the designation of an RSO (or LSO). This written plan will include--

(a) Emergency response plans, as necessary.

(b) Accident, incident, and overexposure investigation procedures.

(c) Provisions to ensure the safe use of radiation sources.

(4) Ensure that an annual audit of the RSP is performed and documented (if an RSP is required by paragraph (2) above). The audit may be performed by in-house personnel or by an outside auditor (e.g., the RSO, a staff medical physicist, an RSO from another command, etc.). The triennial survey by the USACHPPM or an RMC may be used to satisfy this requirement for the years those surveys are conducted.

(5) Ensure that all personnel occupationally exposed to radiation receive appropriate radiation safety training commensurate with potential hazards from radiation sources that they may encounter.

(6) Maintain an inventory of radiation sources as higher headquarters directs and IAW requirements of NRC licenses, Army reactor permits, ARAs, and technical publications.

(7) For radioactive commodities in the command, establish written policies and procedures as necessary to assure compliance with radiation safety requirements in applicable technical publications. (See AR 11-9, paragraph 2-1b(1).)

n. Each CRSO will--

(1) Act as the principal advisor to the MSC Commander on radiation safety issues.

(2) Develop and implement a Command RSP.

(3) Act as the Command POC with the MEDCOM RSSO.

(4) Within an RMC, perform or coordinate the performance of the responsibilities listed in paragraph 1-5j.

o. Each MEDCOM Installation RSO will--

(1) Develop and implement the installation RSP.

(2) Advise the installation commander on radiation safety issues.

(3) Support tenant activities on the installation in meeting the requirements of applicable NRC licenses and ARAs.

(4) Notify the appropriate NRC license holder when a building or area that currently or formerly contained radioactive commodities is scheduled for demolition or will no longer contain radioactive commodities. This is to provide radioactive commodity license holders appropriate notice so that they can take decommissioning actions as necessary.

(5) Ensure that generally licensed items (e.g., tritium exit signs) are properly disposed.

p. Each RSO will--

(1) Perform or ensure the performance of all radiation safety functions required by applicable Federal, DOD, Army, state, and host nation regulations and NRC license, Army reactor permit, and ARA conditions.

(2) Develop and implement the RSP.

(3) Keep all NRC licenses and ARAs up to date by submitting amendments and renewals as necessary.

(4) Advise and assist the commander concerning radiation safety issues.

(5) Review procurement, purchases, or transfers of radioactive materials or x-ray systems.

(6) Establish plans and procedures for handling credible emergencies involving radiation and radioactive materials. This includes coordination with civilian and military emergency response organizations as necessary.

(7) Review and approve all standing operating procedures (SOPs) for radiation sources used under their program. If an RSC is established, the committee will approve SOPs.

(8) Coordinate with supporting medical personnel to help assure that personnel receive appropriate occupational health surveillance (AR 40-5).

(9) For an RSO with laser safety responsibilities, assume the responsibilities of an LSO as listed in section 1.3.2, ANSI Z136.1, except for occupational health responsibilities. (The RSO or LSO will assist the occupational health physician as necessary in meeting laser occupational health responsibilities.)

1-6. MEDCOM RADIATION SAFETY COUNCIL.

a. The MRSC will be the MEDCOM Commander's advisory body to provide recommendations for MEDCOM radiation safety directives and to gather and disseminate information about the status of the MEDCOM RSP.

b. Membership will include--

(1) The CoS, MEDCOM (or his designee) as chairperson.

(2) The MEDCOM RSSO.

(3) The MEDCOM Safety Director.

(4) Representatives of Health Care Operations, Health Care Policy and Services, Health Care Facilities, Logistics, Resource Management, Staff Judge Advocate General, and the OTSG Nuclear Medical Science Officer/Radiological Hygiene Consultant.

(5) A representative of the MSCs (nonvoting).

(6) Other members as designated by the chairperson.

c. The MRSC will meet at least once each 6-month period and at the call of the chair or the MEDCOM RSSO.

1-7. DEVIATIONS.

a. Deviations from Army radiation safety standards and procedures require the approval of the Commander, MEDCOM and will be IAW AR 11-9. Deviations from this regulation require the approval of the Commander, MEDCOM.

b. Deviations from Federal and DOD regulations and standards and from NRC license, Army reactor permit, and ARA conditions, including those implemented in technical publications, are not authorized.

c. Requests for deviation from Army standards and or this regulation will be submitted through command channels to the Commander, MEDCOM.

CHAPTER 2

IONIZING RADIATION SOURCES

2-1. GENERAL.

a. All MEDCOM personnel using radioactive material or x-ray equipment will comply with applicable Federal, DOD, Army, state, and host nation regulations and guidance and the conditions of the NRC licenses or ARAs under which the material or equipment is licensed or authorized.

b. All MEDCOM organizations that use radiation sources will ensure personnel are aware of applicable regulations, guidance, and local policies and procedures.

c. Exposure to ionizing radiation will be kept as low as reasonably achievable (ALARA).

d. Design and evaluation of shielding for x-ray facilities will be performed IAW TB MED 521. Design and evaluation of shielding for radioactive materials facilities will be performed IAW current industry standards.

(1) A qualified expert approved by the USACHPPM or a CRSO at an RMC will perform the evaluations.

(2) IAW AR 11-9, all evaluations of designs for high radiation areas or very high radiation areas will receive an independent review. For example, if the initial evaluation is performed by an RMC then the USACHPPM or another RMC may perform the independent review.

e. Surveys of x-ray systems will be conducted prior to use for the diagnosis or treatment of human patients and periodically thereafter as specified in TB MED 521.

f. Dispose of all radiation sources IAW AR 11-9.

2-2. NUCLEAR REGULATORY COMMISSION LICENSES.

a. Any MEDCOM organization within the boundaries of the United States and its territories and possessions that desires to use byproduct, source, or special nuclear material will obtain an appropriate NRC license prior to the acquisition or use of such material if required. Any MEDCOM organization outside the boundaries of the United States that desires to use such material must obtain an ARA. (See paragraph 2-3.)

b. Applications for new licenses and renewals will be submitted on NRC Form 313 (or as directed by the NRC) and will be prepared IAW the appropriate NRC Regulatory Guides.

c. Applications for NRC licenses, renewals, or amendments will be submitted as follows:

(1) Applications involving significant changes will be sent through command channels to Commander, USAMEDCOM, ATTN: MCOP-SA, 2050 Worth Road, Fort Sam Houston, TX 78234-6025. Upon MEDCOM approval the application will be forwarded to the NRC. Significant amendments include, but are not limited to--

(a) New NRC licenses.

(b) Termination of an NRC License.

(c) License renewals (only if it includes a significant change in the program).

(d) The addition or deletion of a significant capability (e.g., therapy treatment, nuclear medicine, etc.), removal of an entire building from the license, significant changes in procedures, etc. The MEDCOM RSSO may forward applications, renewals, or amendments to the USACHPPM for technical review at his/her discretion.

(2) For all other changes--

(a) The MSCs may submit the application directly to the NRC unless directed otherwise by the MRSC.

(b) Subordinate units will submit the application through the appropriate MSC. The CRSO may forward the application directly to the NRC.

d. When required, applications for renewal of NRC licenses will be submitted to MEDCOM at least 60 days prior to the expiration date of the license. MEDCOM will review the application and forward it to the NRC at least 30 days prior to the expiration date IAW 10 CFR 30.36.

e. Each CRSO will ensure that copies of all correspondence to and from the NRC concerning each NRC license are furnished to Commander, USACHPPM, ATTN: MCHB-TS-OHP, 5158 Blackhawk Road, APG, MD 21010-5403 for archival IAW AR 11-9.

2-3. ARMY RADIATION AUTHORIZATIONS.

a. Any MEDCOM organization that desires to use naturally occurring or accelerator-produced radioactive material (NARM) or a linear accelerator will obtain an ARA IAW AR 11-9 prior to the acquisition or use of such material or equipment. Any MEDCOM facility outside the boundaries of the United States and its territories and possessions that desires to use byproduct, source, or special nuclear material must also obtain an ARA. Host nation regulations and SOFAs may establish additional requirements, such as obtaining a foreign radioactive materials license. Obtaining a foreign license does not replace the requirement to obtain an ARA. In these cases, both an ARA and a foreign license are required. Copies of the foreign license will be forwarded to USACHPPM IAW paragraph 2-2e above.

b. Applications for new ARAs or a renewal of an existing ARA will be submitted on Department of the Army (DA) Form 3337, Application for Department of the Army Radiation Authorization or Permit or electronic equivalent.

(1) If the organization already possesses an NRC license that authorizes radioactive material for the same purposes as requested for the ARA material, the application need only include the following:

(a) A description of the radioactive material (including the nuclide, chemical/physical form, and the maximum quantity to be possessed).

(b) The purpose for which the material will be used.

(c) A reference to the NRC license.

(2) If the organization is requesting radioactive material for purposes other than those authorized by their NRC license (or does not possess an NRC license), the application must include all the information that would be required for an NRC license application for those purposes.

(3) If the organization wishes to use linear accelerators, the application must include the following:

(a) A description of the linear accelerator(s) (including the manufacturer, model, serial number, and the maximum photon/electron energy).

(b) The purpose for which the linear accelerator(s) will be used.

(c) Either a statement indicating that the procedures and policies in TB MED 521 will be implemented *or* the applicant's program for the safe use of the linear accelerator(s). If an applicant chooses to submit his/her own program, it must provide at least the same level of protection as TB MED 521.

(4) Overseas organizations may reference a host nation license if one is possessed. However, additional information may be required to ensure compliance with U.S. standards.

c. Applications for new ARAs, renewal of existing ARAs, and amendments will be sent through command channels to Commander, USAMEDCOM, ATTN: MCPO-SA, 2050 Worth Road, Fort Sam Houston, TX 78234-6025. The MEDCOM RSSO may forward the applications to the USACHPPM for technical review at his/her discretion.

d. Applications for renewal of ARAs will be sent through command channels to MEDCOM at least 30 days prior to the expiration date of the ARA. ARAs for which renewal has been requested within this time frame will be deemed timely filed and will not expire until final action has been taken concerning the renewal request.

e. New ARAs, ARA renewals, ARA terminations, and ARA amendments that involve a major change in capabilities will be signed by the CoS, MEDCOM. A Deputy Chief of Staff or equivalent may sign all other ARA actions.

f. ARAs will expire after a term of 5 years from the date of issue.

g. Each CRSO will ensure that copies of all correspondence to and from MEDCOM concerning each ARA are furnished to the USACHPPM for archival IAW AR 11-9.

2-4. ARMY RADIATION PERMITS.

a. A non-Army agency that will possess, use, or store an ionizing radiation source on a MEDCOM installation that would require an NRC license or ARA if possessed by an Army organization must obtain an ARP from the installation commander.

b. Applications for ARPs will be submitted through the appropriate tenant commander to the installation commander at least 30 days prior to the requested start date of the permit.

c. The installation RSO will review permit applications for adequacy and compliance with the requirements of AR 11-9 and provide oversight of the agency's activities in complying with their license and ARP while on Army property. The installation RSO will also maintain records of all ARPs granted.

2-5. NATURALLY OCCURRING AND ACCELERATOR-PRODUCED RADIOACTIVE MATERIALS.

a. Within the United States, naturally occurring and accelerator-produced radioactive materials (NARM) are normally regulated by individual states. However, the licensing and use of NARM on Federal property is not governed by state regulations. The Federal Government has not given regulatory authority to the states for licensing and use of radioactive materials or radiation-producing devices and other aspects of radiation safety on Federal property. Within the Army, AR 11-9 governs these issues.

b. However, in issues that affect the environment, such as radioactive waste disposal and releases of radioactive material, state regulations will apply. RSOs must ensure that state regulations are followed in these situations.

c. Organizations outside U.S. boundaries will also need to consider host nation regulations and SOFA requirements.

d. Naturally occurring radioactive materials (NORM) are a subgroup of NARM. Appendix B contains additional information regarding naturally occurring radioactive materials (NORM) that may be useful to RSOs.

2-6. PERSONNEL OCCUPATIONAL MONITORING.

a. Each facility that uses ionizing radiation sources will establish an occupational personnel monitoring program IAW the requirements of 10 CFR 20, 29 CFR 1096, and AR 11-9 to ensure that radiation doses are kept within established dose limits and ALARA.

b. Personnel who are exposed to x-rays scattered from the patient (e.g., in fluoroscopy or cardiac catheterization) will wear a protective apron and be issued both a whole-body dosimeter and a collar dosimeter. The whole-body dosimeter will be worn under the lead apron, between the waist and the shoulders (or, for declared pregnant personnel, over the developing fetus.) The collar dosimeter will be worn outside the lead apron at collar level.

(1) The Total Effective Dose Equivalent (TEDE) will be calculated by

$$TEDE = (0.04)C + (1.5)W$$

where C is the deep dose equivalent recorded by the collar dosimeter, W is the deep dose equivalent recorded by the whole-body dosimeter, and 0.04 and 1.5 are the weighting factors for the head and trunk (whole-body), respectively.

(2) The eye dose equivalent recorded by the collar dosimeter will be used to demonstrate compliance with dose limits for the lens of the eye.

c. Personnel who help prepare or administer a therapeutic dosage of iodine-131 (I-131) will receive a thyroid bioassay as required by 10 CFR 35. This bioassay measurement will be made at least 24 hours, but no more than 72 hours, after the preparation or administration of the I-131 dosage.

d. In research facilities a variety of radionuclides may be used. The RSO must evaluate each individual's need for dosimetry and/or bioassay on a case-by-case basis.

e. All bioassay results will be forwarded through the supporting CRSO to the IRDB, Redstone Arsenal, Alabama IAW AR 11-9. As a minimum, the following information will be provided to the IRDB for each individual who receives a bioassay:

(1) Individual's full name, social security number (SSN), occupational specialty code, and assigned work location.

(2) The date(s) of the exposure and the type of exposure (i.e., chronic or acute).

(3) The radionuclide, lower limit of detection (LLD), original counting data, and estimated intake.

(4) The committed effective dose equivalent (CEDE).

(5) The committed dose equivalents (CDEs) to each organ.

f. A qualified expert will calculate the CEDE and CDEs from the bioassay data, using methods approved by TSG. For all data less than or equal to the LLD, the data will be submitted as such, with a recommendation that no dose be assigned.

g. The RSO must also determine on a case-by-case basis the requirement for providing dosimetry to occupationally exposed individuals who work in a research environment using analytical laboratory equipment, such as x-ray diffraction, x-ray fluorescence, alloy analyzers, gas chromatographs, x-ray particle size analyzers, electron microscopes, and static eliminators.

2-7. RADIATION SAFETY COMMITTEE REPORT (RCS MED-197).

a. The quarterly RCS MED-197 report will be the MEDCOM RSSO's primary tool in providing oversight of RSPs within the MEDCOM. It will provide the MEDCOM RSSO with an overview of the effectiveness of the RSP at each activity and will assist in identifying trends and common radiation safety issues.

b. As a minimum, the report will include the following:

(1) The minutes of the most recent RSC meeting. These minutes will include personnel exposure summaries, radiation safety training status reports, inventory and leak test status reports, radiation incident/accident summaries and actions taken to prevent recurrences, identification of problem areas, and other items as determined by the chairperson.

(2) All enclosures and attachments to the RSC meeting minutes.

(3) Copies of any reviews, audits, or inspections of the organization's RSP. This includes, but is not limited to, NRC inspection results, SAV reports, and annual program reviews.

c. This report will be submitted through command channels to the MEDCOM RSSO within 30 days after each RSC meeting is held. Reports not received within 5 working days after the end of each calendar quarter will be considered delinquent.

d. If an organization possesses an NRC license or ARA, but is not required to establish an RSC, the RSO will prepare an RCS MED-197 report containing information equivalent to that required in paragraph b above and forward it through command channels to the MEDCOM RSSO at least once each calendar quarter.

e. After review, the MEDCOM RSSO will forward all RSC Reports to the USACHPPM for archiving.

CHAPTER 3

NONIONIZING RADIATION SOURCES

3-1. GENERAL.

a. All MEDCOM facilities will establish a laser safety program IAW AR 11-9 and applicable industry standards (e.g., ANSI Z136.1-2000 and ANSI Z136.3-1996) if required by AR 11-9.

b. Each MEDCOM installation will obtain a nonionizing radiation survey from the USACHPPM at least once every 3 years IAW AR 11-9 and AR 40-5 to ensure compliance with safety and health regulations. The radiofrequency radiation (RFR) surveys will be conducted IAW TB MED 523 and the high-intensity optical source survey will be conducted IAW TB MED 524.

c. All MEDCOM facilities will obtain equipment studies and evaluations of any Army materiel that emits RFR or high-intensity light as early in the procurement process as practical, IAW AR 11-9 and AR 40-5.

d. All suspected RFR overexposures and high-intensity optical accidents and incidents will be reported and investigated IAW AR 11-9 and AR 40-5. (Note: Personnel exposure limits are intended to protect personnel from unintentional exposure to RFR and high-intensity optical sources and are not intended to be applied to patients receiving therapy under a physician's care.)

e. All MEDCOM organizations will comply with the RSP in DOD Instruction (DODI) 6055.11. All transmitters that emit radiation will comply with the radiation safety standards set forth in applicable technical publications.

f. MEDCOM organizations shall not adopt practices or conduct operations that involve the planned exposure of personnel to RFR levels which exceed the permissible exposure limits (PELs) as set forth in DODI 6055.11, except when the procedure is part of a medical therapy administered at the request of an authorized healthcare provider.

g. MEDCOM organizations shall identify, attenuate, or control potentially hazardous RF electromagnetic fields and other radiation hazards associated with Army electronic equipment by engineering design, administrative actions, protective equipment, or a combination thereof.

3-2. RADIOFREQUENCY DIATHERMY. All radiofrequency (RF) diathermy shall be performed IAW AR 11-9 and TB MED 523. As a minimum, the following guidance shall be observed:

a. Safety Awareness Training. Conduct annual refresher training on the proper use of RF diathermy equipment.

b. Limitations and Restrictions pertaining to RF diathermy.

(1) RF diathermy shall only be performed at the request of an authorized healthcare provider.

(2) Exercise extreme caution while operating RF diathermy equipment so as to not inadvertently expose the eyes of the patient or the practitioner to concentrated RF radiation through improper coil positioning.

(3) Minimize personnel in the treatment room/facility while RF diathermy treatment is provided.

(4) Use the minimum output power level and duration consistent with the medical requirements of the RF therapy or RF diathermy.

(5) Do not place the patient on any grounded surfaces including metal beds, gurneys, or beds with metal springs.

c. The RF Diathermy Controls. Post RF warning signs concerning cardiac pacemakers at entrances to Physical Therapy clinics where RF diathermy is performed. These RF warning signs shall be posted at all entrances and shall be clearly visible to all personnel who enter.

d. Procedures and Methods.

(1) Ensure that medical maintenance personnel/technicians are properly trained to service, repair, and/or calibrate RF diathermy equipment IAW manufacturer's specifications.

(2) Ensure that all RF diathermy equipment is in calibration when placed in service. All equipment that is "out of calibration" shall be tagged and removed from service until serviced, repaired, and/or calibrated.

3-3. ELECTROMAGNETIC INTERFERENCE. The following guidance constitutes the minimum criteria for promoting electromagnetic compatibility (EMC) and reducing electromagnetic interference (EMI) in the medical treatment environment:

a. Safety Awareness Training. Conduct preemployment and annual refresher training for Critical Care Area and medical maintenance staff on recognition and reporting of EMI associated with RF electronic equipment, including RF telemetry and RF diathermy equipment.

b. Limitations and Restrictions on the use of Wireless RF Transmitting Devices.

(1) Restrict the use of all personal wireless transmitting RF devices, including but not limited to cellular phones, bi-directional pagers, computers and walkie-talkies, in all areas designated as Critical Care Areas. These normally include, but are not limited to, areas such as Intensive Care Units, Surgical Wards, Neonatal Wards, and Emergency Rooms.

(2) Limit the use of wireless RF transmitting devices, including but not limited to cellular phones, bi-directional pagers, personal digital assistants (PDAs) and walkie-talkies, in the Emergency Room and associated areas. Wireless RF transmitting devices should only be used in these areas when used to render medical treatment and should be used at least 1 meter (m) (3.3 feet) from any electronic medical equipment.

c. Controls on the use of Wireless RF Transmitting Devices.

(1) Post EMI warning signs instructing users to turn off all personal wireless RF transmitting devices, including cellular phones, at the entrance to all Critical Care Areas (refer to National Fire Protection Agency Publication No. 99). These EMI warning signs shall be posted at all entrances and shall be clearly visible to all personnel who enter.

(2) Post EMI warning signs limiting the use of official wireless RF transmitting devices, including radios and telemetry equipment, at the entrance to all Critical Care Areas. These EMI warning signs shall be posted at all entrances and shall be clearly visible to all personnel who enter.

d. Reporting of EMI incidents shall be IAW paragraph 4-8.

CHAPTER 4

SPECIAL REPORTING REQUIREMENTS

Section I. Ionizing Radiation

4-1. GENERAL.

a. Accidents and incidents involving ionizing radiation will be reported IAW AR 385-40 when applicable.

b. Any incident or accident involving radioactive materials that requires reporting to the NRC, the Department of Transportation, or any other government agency will also be reported to the MEDCOM RSSO. Copies of any written reports required will also be provided to the MEDCOM RSSO. These notifications will be provided to the MEDCOM RSSO under the same time constraints as for the notification to the NRC or other agency.

c. Any incident or accident involving radioactive materials or radiation-producing devices will be reported to the MEDCOM RSSO IAW paragraphs 4-2 thru 4-8.

d. The MEDCOM RSSO will notify the Commander, MEDCOM; the CoS, MEDCOM; and other MEDCOM staff principals of radiation incidents and accidents. The MEDCOM Safety Director and Provost Marshal will also be informed when appropriate.

e. The MEDCOM RSSO will forward any written reports to the USACHPPM for archival in the NRC license and ARA archives.

f. The requirements of this chapter are not intended to preclude any individual from contacting the NRC directly, or the respective chain of command.

4-2. LOSS OR THEFT OF RADIOACTIVE MATERIAL. The RSO will report the loss or theft of radioactive material as follows:

a. Immediately by telephone after the loss of radioactive material in an aggregate quantity greater than or equal to 1000 times the quantity specified in Appendix C to 10 CFR Part 20 becomes known.

b. Within 30 days by telephone after the RSO becomes aware of missing radioactive material in a quantity greater than 10 times the quantity specified in appendix C to 10 CFR Part 20 that is still missing at that time. The RSO will include in the report a complete list of all radioactive material not accounted for during the 12 calendar months preceding the report.

c. Immediate telephonic notification is required when theft of any amount of radioactive material or criminal mischief is suspected. Examples of suspicious circumstances are as follows:

(1) Evidence of a break-in or attempted break-in.

(2) Attempts by unauthorized persons to gain access to secure areas.

(3) Sources or devices discovered missing after an area was left unsecured or visited by an unauthorized person.

(4) Evidence of attempts by anyone to deliberately compromise the controls for the safe use of radioactive materials and radiation-producing devices.

d. Within 30 days after an incident is discovered, a written report will be forwarded to the MEDCOM RSSO. The written report shall include, as a minimum--

(1) A description of the radioactive material involved, including kind, quantity, and chemical and physical form.

(2) A description of the circumstances under which the loss or theft occurred.

(3) A statement of disposition, or probable disposition, of the licensed material involved.

(4) Exposures of individuals to radiation, circumstances under which the exposures occurred, and the possible TEDE to persons in unrestricted areas.

(5) Actions that have been taken, or will be taken, to recover the material.

(6) Procedures or measures that have been, or will be, adopted to ensure against a recurrence of the loss or theft of licensed material.

4-3. INCIDENTS OR ACCIDENTS. The RSO will report any incident or accident involving radioactive materials or radiation-producing devices in which individuals may have been exposed to ionizing radiation as follows:

a. Immediately notify the MEDCOM RSSO if the radiation incident has or may have caused an individual to receive a TEDE of 0.25 Sieverts (Sv) (25 rems) or more; or an eye dose equivalent of 0.75 Sv (75 rems) or more; or a shallow-dose equivalent to the skin or extremities of 2.5 Gray (Gy) (250 rads) or more.

b. Immediately notify the MEDCOM RSSO if the incident resulted in or may have resulted in the release of radioactive material, inside or outside of a restricted area, so that, had an individual been present for 24 hours, the individual could have received an intake greater than or equal to five times the annual limit on intake (the provisions of this paragraph do not apply to the locations where personnel are not normally stationed during routine operations).

c. Notify the MEDCOM RSSO within 24 hours if the incident has or may have caused an individual to receive in a period of 24 hours a TEDE exceeding 0.05 Sv (5 rems); or an eye dose equivalent exceeding 0.15 Sv (15 rems); or a shallow-dose equivalent to the skin or extremities exceeding 0.5 Sv (50 rems).

d. The notification in paragraphs a, b, and c above will be made by telephone to the MEDCOM RSSO.

e. Within 30 days of any telephonic notification a written report will be forwarded to the MEDCOM RSSO. The written report shall include, as a minimum--

(1) The date and time of event.

(2) The radiation-producing device or source involved, including national stock number (NSN), radiation characteristics, and parameters of the event.

(3) A description of the incident, including names and SSN of personnel affected, estimated doses, contamination levels, facilities affected, etc.

(4) Action(s) taken to prevent recurrence.

(5) Recommendations to prevent similar occurrences at other installations using similar sources or devices.

(6) Name and telephone number of RSO.

(7) A statement of when any other applicable agencies were notified.

4-4. MISADMINISTRATIONS.

a. The RSO will report a misadministration involving NRC Licensed or ARA radioactive materials or medical linear accelerator to the MEDCOM RSSO by telephone within 24 hours when due to errors in the calibration, exposure time, treatment geometry, or other factors--

(1) A therapeutic radiation dose is administered to the wrong patient, to the wrong treatment site, or by the wrong mode of treatment.

(2) The administered total dose differs from the total prescribed dose by more than 20 percent.

b. In the event of a therapy misadministration involving a linear accelerator, the activity shall also notify the Command Judge Advocate within 24 hours of discovering a misadministration.

c. Within 15 days after initial telephonic notification of a therapy misadministration, the activity shall send a written report to the MEDCOM RSSO.

4-5. RECORDS.

a. Each ARA holder shall maintain records of the RSP, including--

(1) The provisions of the program.

(2) Audits and other reviews of program content and implementation.

(3) Each ARA holder shall retain the records required by paragraph a(1) above until the ARA is terminated. Each ARA holder shall retain each record required by paragraph a(2) above for 3 years after the record is made or as directed by other applicable regulations.

b. Each activity shall retain a record of each misadministration for 10 years. The record must contain--

(1) The names of all individuals involved in the event (including the physician, allied health personnel, the patient, and the patient's referring physician).

(2) The patient's SSN or Identification number, if one has been assigned.

(3) A brief description of the event.

(4) The effect on the patient.

(5) The action taken, if any, to prevent recurrence.

Section II. Nonionizing Radiation

4-6. MICROWAVE AND RADIOFREQUENCY RADIATION OVEREXPOSURE. Incidents of alleged radiofrequency radiation (RFR) overexposure shall be documented and reported IAW AR 11-9, AR 40-5, AR 385-40, and TB MED 523. As a minimum, the following procedures shall be observed:

a. A patient suspected of receiving an RFR overexposure shall receive a medical evaluation as defined in paragraph d below within 24 hours.

b. The USACHPPM Radiofrequency/Ultrasound (RFUS) Program shall be contacted by telephone within 24 hours after an alleged RFR overexposure. The USACHPPM RFUS program personnel will conduct an investigation of the alleged RFR overexposure to determine if any overexposure occurred and whether the RFR exposure exceeded five times the permissible exposure limit (PEL).

c. The MTF Preventive Medicine Service shall file an incident/accident report using the Medical Surveillance System and AR 385-40. The following information shall be included in the report under the comments category: The date, time, and location of RFR overexposure; the nomenclature of suspected source of RFR overexposure; a

brief synopsis of the incident; a preliminary medical analysis; and a POC for additional information.

d. An optometrist, ophthalmologist, or a qualified medical physician shall perform the following diagnostic protocol if it is determined that the patient did receive an overexposure that exceeded five times the PEL:

(1) An ocular history with emphasis on previous eye injury or disease and the use of medications, especially those with photosensitizing side effects.

(2) Distance Visual Acuity (with correction) in each eye. If the corrected distance visual acuity is less than 20/20 in either eye, then refraction will be performed to obtain the best-corrected visual acuity.

(3) A "slitlamp" biomicroscope examination of the cornea, crystalline lens and other structures accessible to this instrument, recording as a minimum the presence or absence of opacities in the ocular media.

e. Follow-up medical treatment as determined by the attending optometrist, ophthalmologist, or medical physician.

4-7. ELECTROMAGNETIC INTERFERENCE INCIDENTS. An EMI incident occurs when electromagnetic or microwave energy from one electronic device corrupts, alters, or otherwise degrades the performance of another electronic device. All EMI incidents shall be documented and reported IAW TB MED 523. As a minimum, the following procedures shall be observed:

a. Medical staff shall report all incidents or suspected incidents of EMI to the RSO and medical maintenance. The following information shall be included: the type of equipment affected; the suspected source of EMI; the date, time, and location of occurrence; any symptoms observed as a malfunction or interference; and a POC for additional information.

b. The RSO shall archive and retain all EMI incident reports for use in future comparisons.

c. A copy of the report shall be forwarded to USACHPPM RFUS Program for evaluation within 48 hours.

d. A copy of the EMI incident report shall be retained by medical maintenance.

4-8. LASER/OPTICAL OVEREXPOSURE.

a. The special reporting requirements for suspected laser/optical radiation overexposure are given in AR 11-9 paragraph 6-1(a) and TB MED 524.

b. Immediately evacuate personnel suspected of experiencing potentially damaging eye exposure from laser radiation to the nearest medical facility for an eye

examination (see Field Manual 8-50). Laser eye injuries require immediate specialized ophthalmologic care to minimize long-term visual acuity loss. Medical personnel should obtain medical guidance for such emergencies from the Walter Reed Institute of Research Detachment at Brooks Air Force Base (commercial 800 473-3549).

c. The Laser/Optical Program at the USACHPPM must also be notified.

APPENDIX A

REFERENCES

AR 11-9
The Army Radiation Safety Program

AR 40-5
Preventive Medicine

AR 40-7
Use of Investigational Drugs and Devices in Humans and the Use of Schedule I Controlled Drug Substances

AR 40-38
Clinical Investigation Program

AR 70-25
Use of Volunteers as Subjects of Research

AR 385-40
Accident Reporting and Records

DODI 6055.11
Protection of DOD Personnel from Exposure to Radiofrequency Radiation and Military Exempt Lasers

FM 8-50
Prevention and Medical Management of Laser Injuries

TB MED 521
Management and Control of Diagnostic X-Ray, Therapeutic X-Ray, and Gamma-Beam Equipment

TB MED 523
Control of Hazards to Health from Microwave and Radio Frequency Radiation and Ultrasound

TB MED 524
Control of Hazards to Health from Laser Radiation

Title 10, Code of Federal Regulations, Part 20, Standards for Protection Against Radiation, 2000 revision.

Title 29, Code of Federal Regulations, Part 1910.1096, Ionizing Radiation, 1999 revision.

ANSI Standard N13.30, Performance Criteria for Radiobioassay, 1996.

ANSI Standard Z136.1, Safe Use of Lasers, 2000

ANSI Standard Z136.3, Safe Use of Lasers in Health Care Facilities, 1996.

APPENDIX B

NATURALLY OCCURRING RADIOACTIVE MATERIAL (NORM)

B-1. GENERAL.

a. NORM is everywhere in the earth's crust, and is present in surface and subsurface waters. Most NORM is attributable to the decay series of uranium and thorium, plus potassium-40 and rubidium-87. NORM concentrations vary geographically. Radiation exposure to NORM is a significant component of background radiation dose. NORM does not include source, byproduct, or special nuclear material.

b. NORM can interfere with measurements of controlled (licensed) radioactivity in the work place and in the environment, as well as with in-vivo and in-vitro bioassay measurements. Often spectrographic analysis is required to distinguish NORM from controlled materials.

c. NORM may be detected in--

(1) Building materials, including bricks, tiles, concrete, and granite blocks.

(2) Fire brick and refractory brick from boilers and incinerators.

(3) Pipe scale in water systems.

(4) Thoriated tungsten welding electrodes.

(5) Consumer products, including lantern mantles.

(6) Phosphate fertilizers.

(7) Water from deep wells.

B-2. STATE REGULATIONS CONCERNING NORM.

a. NORM is regulated by some states. State regulations typically do not apply on Federal installations; however, state NORM regulations may apply during disposal or recycling of materials off the installation, during base closure operations, or where the Federal Government has granted regulatory authority to the state.

b. State regulations typically exempt NORM-bearing materials with radioactive concentrations that do not differ from those found in nature. NORM-bearing materials with radioactive concentrations that have been technologically enhanced--that is, increased--in comparison to concentrations found in nature are regulated.

c. State regulations address radiation emanating from NORM-bearing materials, as well as surface contamination on NORM-bearing objects. NORM concentrations in soil are also regulated. Typical limits are shown in Table B-1. Organizations confronting NORM issues should check state regulations or agreements for applicable limits.

Table B-1. Typical NORM Limits.

Radiation Exposure Rate	0.013 microcoulombs/kilogram-hour (µC/kg-hr) (0.05 milliroentgens/hour (mR/hr)) including background at any accessible point.
Surface Contamination[a]	Average[bcf]: 83.3 bequerels/100 square centimeters (Bq/100 cm^2) (5000 disintegrations per minute/100 cm^2 (dpm/100cm^2)) Maximum[bdf]: 250 Bq/100 cm^2 (15,000 dpm/100 cm^2) Removable[bcef]: 16.7 Bq/cm^2 (1000 dpm/100 cm^2)
Soil and other media	1.11 bequerels/gram (Bq/g) (30 picocuries/gram (pCi/g)) of technologically enhanced radium-226 or radium-228, averaged over any 100 square meters (m^2), and averaged over the first 15 cm below the surface, provided the radon emanation rate is less than 0.74 bequerels/square meter-second (Bq/m^2-s) (20 pCi/m^2-s). 0.19 Bq/g (5 pCi/g) of technologically enhanced radium-226 or radium-228, averaged as above, where the radon emanation rate is equal to or greater than 0.74 Bq/m^2-s (20 pCi/m^2-s).

a. A single detector that responds to both alpha and beta emitters may be used.

b. Activity measurements (bequerels or dpm) must be made with a ratemeter or scaler and detector appropriate for the type and energy of radiation being monitored, and the appropriate correction factor must be used.

c. Contamination levels should not be averaged over more than 1 m^2. For objects of less surface area, the contamination level should be averaged over the actual surface area of the object.

d. The maximum contamination level applies to an area of not more than 100 cm^2.

e. The amount of removable contamination per 100 cm^2 should be determined by wiping the area with dry filter or soft absorbent paper while applying moderate pressure. The wipe should be evaluated with a counting instrument of known efficiency. When removable contamination on objects smaller than 100 cm^2 is assessed the pertinent levels should be reduced proportionally and the entire surface should be wiped.

f. All surveys and efficiency determinations shall be made with the active surface of the detector no greater than 1 cm from the surface surveyed, wipe counted, or source used. The instrument and protocol used for evaluating wipes shall be sufficient to detect 10 percent of the applicable limit with 95 percent confidence that the activity is detected.

GLOSSARY

Section I
Abbreviations

ALARA ..... as low as reasonably achievable
ANSI ..... American National Standards Institute
AR ..... Army Regulation
ARA ..... Army Radiation Authorization
ARP ..... Army Radiation Permit
Bq ..... bequerel
CDE ..... committed dose equivalent
CEDE ..... committed effective dose equivalent
CFR ..... Code of Federal Regulations
CG ..... Commanding General
CHPPM ..... U.S. Army Center for Health Promotion and Preventive Medicine
Ci ..... curie
cm ..... centimeter
CoS ..... Chief of Staff
CRSO ..... command radiation safety officer
DA ..... Department of the Army
DOD ..... Department of Defense
DODI ..... Department of Defense Instruction
dpm ..... disintegrations per minute
EMC ..... electromagnetic compatibility
EMI ..... electromagnetic interference
eV ..... electron-volt
g ..... gram
Gy ..... gray
hr ..... hour
I-131 ..... iodine-131
IAW ..... in accordance with
IRDB ..... U.S. Army Primary Standards Laboratory, Ionizing Radiation Dosimetry Branch
LLD ..... lower limit of detection
LSO ..... laser safety officer
m ..... meter
MACOM ..... major Army command
µR ..... microroentgen
MEDCOM ..... U.S. Army Medical Command
mg ..... milligram
MRSC ..... MEDCOM Radiation Safety Council
MSC ..... major subordinate command
MTF ..... medical treatment facility
nm ..... nanometer
NARM ..... naturally occurring or accelerated-produced radioactive material

NORM ..... naturally occurring radioactive material
NRC..... U.S. Nuclear Regulatory Commission
NSN ..... national stock number
OTSG ..... Office of The Surgeon General
pCi ..... picocurie
PDA ..... personal digital assistant
PEL ..... permissible exposure limit
POC ..... point of contact
RF ..... radiofrequency
RFR ..... radiofrequency radiation
RFUS ..... radiofrequency/ultrasound
RMC ..... regional medical command
RSC ..... radiation safety committee
RSO ..... radiation safety officer
RSP ..... radiation safety program
RSSO ..... radiation safety staff officer
s ..... second
SAV ..... site assistance visit
SOFA ..... status of forces agreement
SOP ..... standing operating procedure
SSN ..... social security number
Sv ..... sievert
TB MED ..... technical bulletin (medical)
TEDE ..... total effective dose equivalent
TSG ..... The Surgeon General
(USA)CHPPM..... U.S. Army Center for Health Promotion and Preventive Medicine
(USA)MEDCOM..... U.S. Army Medical Command

Section II
Terms

Absorbed dose
The energy imparted by ionizing radiation per unit mass of irradiated material. The units of absorbed dose are the rad and the Gy.

Acceptance test
An evaluation of new equipment used to verify that the equipment meets manufacture specifications, purchase contract requirements, and applicable Federal and Army regulations. An acceptance test should be performed on any new or upgraded x-ray systems prior to use on humans excepts as provided in TB MED 521.

ALARA
Acronym for “as low as reasonably achievable” means making every reasonable effort to maintain radiation doses as far below applicable dose limits as is practical consistent with the purpose for which the activity is undertaken, taking into account the state of technology, the economics of improvements in relation to benefits to the public health

and safety, and other societal and socioeconomic considerations and in relation to utilization of nuclear energy, radioactive materials, and ionizing radiation in the public interest.

Army regulation
A directive that sets forth missions, responsibilities, and policies, and establishes procedures to ensure uniform compliance with those policies.

Background radiation
Radiation from cosmic sources; NORM, including radon (except as a decay product of source or special nuclear material); and global fallout as it exists in the environment from the testing of nuclear explosive devices or from past nuclear accidents such as Chernobyl that contribute to background radiation. Background radiation does not include radiation from source, byproduct, or special nuclear materials that the NRC regulates or from NARM that the Army regulates.

Becquerel (Bq)
The SI unit of radioactivity equivalent to one nuclear transformation (disintegration) per second.

Bioassay (radiobioassay)
The determination of kinds, quantities or concentrations, and, in some cases, the locations of radioactive material in the human body, whether by direct measurement *(in vivo* counting) or by analysis and evaluation of materials excreted or removed from the human body *(in vitro* counting).

Byproduct material
Any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material.

Committed dose equivalent (CDE)
The dose equivalent to organs or tissue of reference that will be received from an intake of radioactive material by an individual during the 50-year period following the intake.

Committed effective dose equivalent (CEDE)
The sum of the products of the weighting factors applicable to each of the body organs or tissues that are irradiated and the CDE to these organs or tissues.

Commodity, radioactive
See Radioactive commodity.

Curie (Ci)
A unit of radioactivity equal to 37 billion becquerels.

Decommission
To remove (as a facility) safely from service and reduce residual radioactivity to a level that permits release of the property for unrestricted use and termination of the NRC license, Army reactor permit, or ARA.

Deep-dose equivalent
Applies to external whole-body exposure and is the dose equivalent at a tissue depth of 1 cm (1000 milligrams (mg)/cm^2).

Deviation
A departure from the requirements of this regulation.

Dose equivalent
The product of absorbed dose in tissue, quality factor and all other necessary modifying factors at the location of interest in tissue. The units of dose equivalent are the rem and Sv.

Effective dose equivalent
The sum of the products of the dose equivalent to the organ or tissue and the weighting factors applicable to each of the body organs or tissues that are irradiated. The units of dose equivalent are the rem and Sv.

Exposure
In risk management, the frequency and length of time subjected to a hazard.

Eye dose equivalent
Applies to the external exposure of the lens of the eye and is taken as the dose equivalent at a tissue depth of 0.3 cm (300 mg/cm^2).

Generally licensed item
Any item containing radioactive material that is manufactured by someone licensed under 10 CFR 32 to manufacture and/or distribute generally licensed items. Users of generally licensed items are subject to the requirements of 10 CFR 31.

Giga- (G)
An SI unit prefix indicating a factor of one billion (10^9).

Gray (Gy)
The SI unit of absorbed dose. One gray is equal to an absorbed dose of 1 joule/kilogram. 1 Gy = 100 rads.

Hazard
Any real or potential condition that can cause injury, illness, death of personnel, damage to or loss of equipment or property, or mission degradation.

High radiation area
An area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 1 millisieverts (0.1 rem) in 1 hour at 30 cm from the radiation source or from any surface that the radiation penetrates.

Image Quality Control Program
A systematic program established to monitor the parameters that affect the quality of radiographic images and ensure that corrective actions are taken before the quality of the image degrades to the point that it affects the physicians ability to interpret the image.

Installation
Land and improvements permanently affixed thereto which are under the control of DA and used by Army organizations. Where installations are located contiguously, the combined property is designated as one installation and the separate functions are designated as activities of that installation. In addition to those used primarily by troops, the term installation applies to real properties such as depots, arsenals, ammunition plants (both contractor and Government operated), hospitals, terminals, and other special mission installations.

Intake
The amount of radioactive material inhaled, ingested, injected, or absorbed through the skin.

Ionizing radiation
Charged subatomic particles and ionized atoms with kinetic energies greater than 12.4 electron-volts (eV), electro-magnetic radiation with photon energies greater than 12.4 eV, and all free neutrons and other uncharged subatomic particles (except neutrinos and antineutrinos).

Kilo- (k)
An SI unit prefix indicating a factor of 1000.

Laser
A device that produces an intense, coherent, directional beam of light by stimulating electronic or molecular transitions to lower energy levels. An acronym for light amplification by stimulated emission of radiation. Lasers are classified by degree of potential hazard (see 21 CFR 1040.10 and ANSI Z136.1 for definitions of laser hazard classes).

Lower limit of detection (LLD)
A calculated value that represents the lowest amount of radioactivity that can be detected by a specific radiation measurement system under specified conditions.

Micro-(µ)
An SI unit prefix indicating a factor of one one-millionth (10^{-6}).

Milli- (m)
An SI unit prefix indicating a factor of one one-thousandth (0.001).

Naturally occurring or accelerator-produced radioactive material (NARM)
Radioactive material not classified as byproduct, special nuclear, or source material; NARM includes NORM.

Nonionizing radiation
Electromagnetic radiation with photon energies less than 12.4 eV

Occupationally exposed individual
A person whose assigned job duties involve exposure to radiation or to radioactive material from regulated and unregulated sources of radiation, whether in the possession of the employer or other person.

Optical radiation
See Visible light.

Overexposure
Any exposure to radiation that exceed permissible exposure standards.

Particle accelerator
A device that is able to accelerate electrons (or other charged particles) to high energies. These particles may be used directly or made to collide with a target material to produce photons or cause nuclear reactions in the target material.

Qualified expert
A person who, by virtue of training and experience, can provide competent authoritative guidance about certain aspects of radiation safety. Being a qualified expert in one aspect of radiation safety does not necessarily mean that a person is a qualified expert in a different aspect. Forward requests for determination of whether a certain individual is a qualified expert through command channels to the MACOM RSSO as necessary. Forward these requests to Headquarters, DA (DACS-SF), WASH DC 20310-0200, for further evaluation as necessary.

Rad
A unit of absorbed dose. One rad is equal to an absorbed dose of 0.01 Gy.

Radiation
For the purposes of this regulation, unless otherwise specified, radiation includes both ionizing and nonionizing radiation.

Radiation safety
For the purposes of this regulation, a scientific discipline whose objective is the protection of people and the environment from unnecessary exposure to radiation. Radiation safety is concerned with understanding, evaluating, and controlling the risks from radiation exposure relative to the benefits derived. Same as *health physics and radiation protection*.

Radiation safety committee
An advisory committee for the commander to assess the adequacy of the command's RSP. Same as *radiation control committee and radiation protection committee*.

Radiation Safety Officer
The person that the commander designates, in writing, as the executive agent for the command's RSP. Same as *radiation protection officer*.

Radiation safety program
A program to implement the objective of radiation safety. An RSP includes all aspects of measurement and evaluation of radiation and radioactive material as they pertain to protection of personnel and the environment and compliance with applicable Federal, DOD, Army, state, and host nation radiation safety regulations.

Radioactive commodity
An item of Government property made up in whole or in part of radioactive material. An NSN or part number is assigned to commodities containing radioactive material greater than 0.37 GBq (0.01 curies (Ci)).

Radioactive waste
Solid, liquid, or gaseous material that contains radionuclides regulated under the Atomic Energy Act, as amended, or is of sufficient quantity to require an ARA, and is of negligible economic value considering the cost of recovery.

Radiobioassay
See bioassay.

Radiofrequency radiation (RFR)
Electromagnetic radiation with frequencies between 3 kilohertz (kHz) and 300 gigahertz (GHz).

Rem
A unit of any of the quantities expressed as dose equivalent. The dose equivalent in rems is equal to the absorbed dose in rads multiplied by a quality factor (1 rem = 0.01 Sv).

Risk
Chance of hazard or bad consequences; exposure of chance of injury or loss. Risk level is expressed in terms of hazard probability and severity.

Severity
The expected consequence of an event in terms of degree of injury, property damage, or other mission impairing factors (loss of combat power, adverse publicity, and so on), that should occur.

Shallow dose equivalent
Applies to the external exposure of the skin or an extremity and is taken as the dose equivalent at a tissue depth of 0.007 cm (7 mg/cm^2) averaged over an area of 1 cm^2.

Sievert (Sv)
The SI unit of any of the quantities expressed as dose equivalent. The dose equivalent in sieverts is equal to the absorbed dose in grays multiplied by the quality factor (1 Sv = 100 rem).

Site Assistance Visit (SAV)
An evaluation of the RSP (or any portion of the RSP) conducted at the request of the organization receiving the visit or at the direction of an RMC Commander. SAVs are intended to provide technical assistance in improving the RSP and assist in correcting program deficiencies.

Source material
Uranium or thorium, or any combination thereof, in any physical or chemical form or ores that contain by weight one-twentieth of one percent (0.05%) or more of uranium, thorium, or any combination thereof. Source material does not include special nuclear material.

Special nuclear material
Plutonium, uranium-233, uranium enriched in the isotope 233 or in the isotope 235, or any material artificially enriched by any of the foregoing.

Total effective dose equivalent (TEDE)
The sum of the deep-dose equivalent (for external exposures) and the CEDE (for internal exposures).

Triennial Survey
An evaluation of the RSP at an installation, an NRC licensee, an Army Reactor Permit holder, or an ARA holder conducted every 3 years by either the USACHPPM or the supporting RMC as established by this regulation. These surveys are conducted for the Commander, MEDCOM to meet the requirement in AR 11-9 paragraph 1-4g(3).

Very high radiation area
An area, accessible to individuals, in which radiation levels could result in an individual receiving an absorbed dose in excess of 5 Gy (500 rads) in 1 hour at 1 m from a radiation source or from any surface that the radiation penetrates.

Visible light
Electromagnetic radiation with wavelengths between about 380 nanometers (nm) and 780 nm.

Weighting factor
For an organ or tissue, the proportion of the risk of stochastic effects resulting from irradiation of that organ or tissue to the total risk of stochastic effects when the whole body is irradiated uniformly.

The proponent of this publication is the Proponency Office for Preventive Medicine. Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) to Commander, U.S. Army Medical Command, ATTN: MCPO-SA, 2050 Worth Road, Fort Sam Houston, TX 78234-6010.

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